



DigiRail Connect

INSTRUCTION MANUAL V1.0x F



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1. SAFETY ALERTS

The symbols below are used in the device and throughout this manual to draw the user's attention to important information related to device safety and use.

		
CAUTION Read the manual fully before installing, and operating the device.	CAUTION OR HAZARD Risk of electric shock.	ATTENTION Material sensitive to static charge. Check precautions before handling.

All safety recommendations appearing in this manual must be followed to ensure personal safety and prevent damage to the instrument or system. If the instrument is used in a manner other than that specified in this manual, the device's safety protections may not be effective.

2. PRESENTATION

The **DigiRail Connect** module is a device that has a series of electronic channels of analog and digital inputs and outputs (IOs) that can be accessed and controlled through serial communication ports.

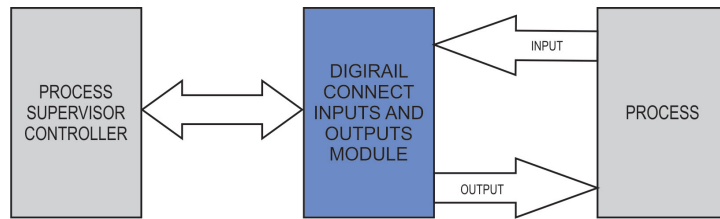


Fig. 01 – DigiRail Connect Process

The **DigiRail Connect** module has eight models with five different channel types: digital input channels (D), analog input channels (A), digital output channels (K), relay output channels (R) and analog output channels (O).

The configuration of the **DigiRail Connect** module can be performed using the **NXperience** configurator software, which allows you to define the functions and mode of operation of the input and output channels and the communication ports. In addition, **NXperience** allows you to force values into the analog and digital inputs and outputs and perform analysis of information about the Ethernet interface and the device.

3. IDENTIFICATION

3.1 DEVICE IDENTIFICATION

The identification of the device model is described on its side label, together with information regarding its power supply and its serial number. Fig. 02 shows the information available in the device housing:

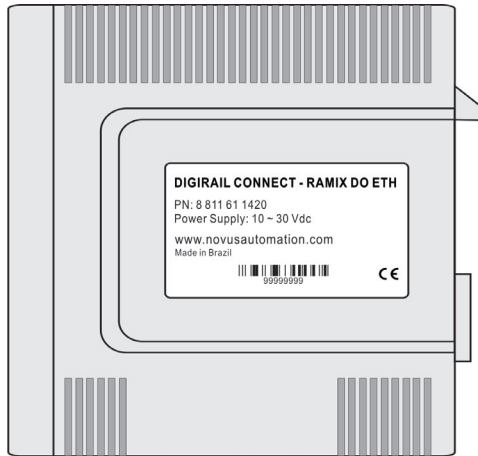


Fig. 02 – DigiRail Connect

3.2 DEVICE MODEL

DigiRail Connect has four models that address any user needs. All models have a USB port, an RS485 serial communication port and an Ethernet communication port. The particular characteristics of DigiRail Connect can be seen in Table 01.

		Analog Input	Analog Output	Digital Input	Digital Transistor Output	Digital Relay Output
RAMIX	DO ETH	2	2	4	3	x
	RL ETH	2	2	4	x	2
DMIX	DO ETH	x	x	8	8	x
	RL ETH	x	x	8	x	4

Table 01 – DigiRail Connect Models

3.2.1 RAMIX DO ETH / RAMIX RL ETH MODELS

The DO ETH model has 2 analog inputs, 2 analog outputs, 4 digital inputs and 3 digital outputs, as shown in **Fig. 03**.

The RL ETH model has 2 analog inputs, 2 analog outputs, 4 digital inputs and 2 relay outputs, as shown in **Fig. 04**.

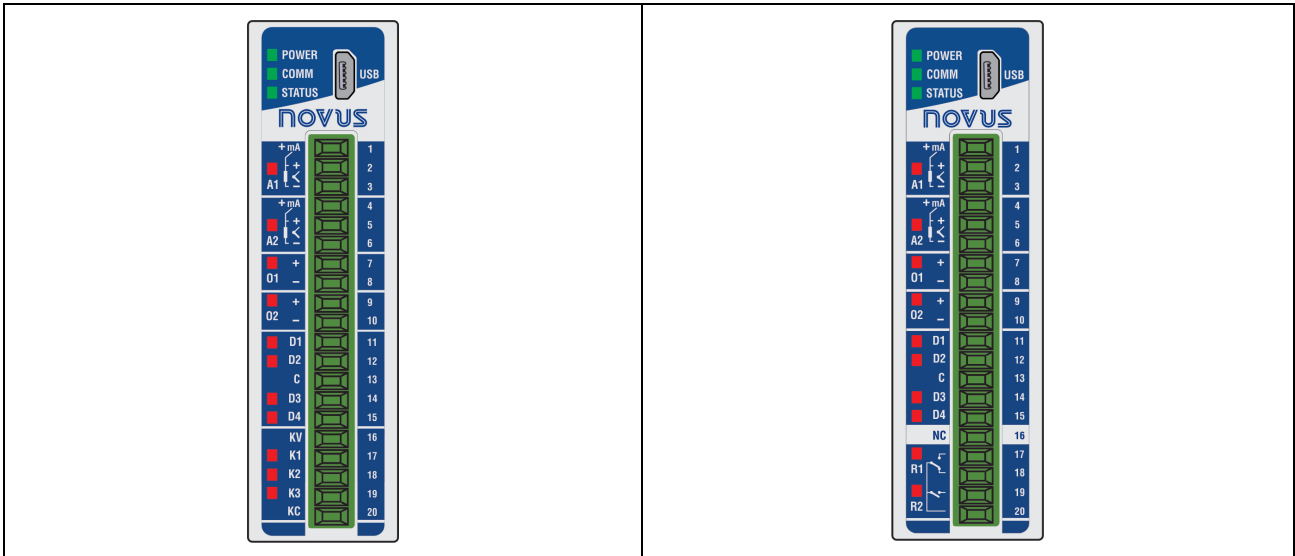


Fig. 03 – DO ETH Model

Fig. 04 – RL EHT Model

3.2.2 DMIX DO ETH / DMIX RL ETH MODELS

The DO ETH model has 8 digital inputs and 8 digital outputs, as shown in **Fig. 05**.

The RL EHT model has 8 digital inputs and 4 relay outputs, as shown in **Fig. 06**.

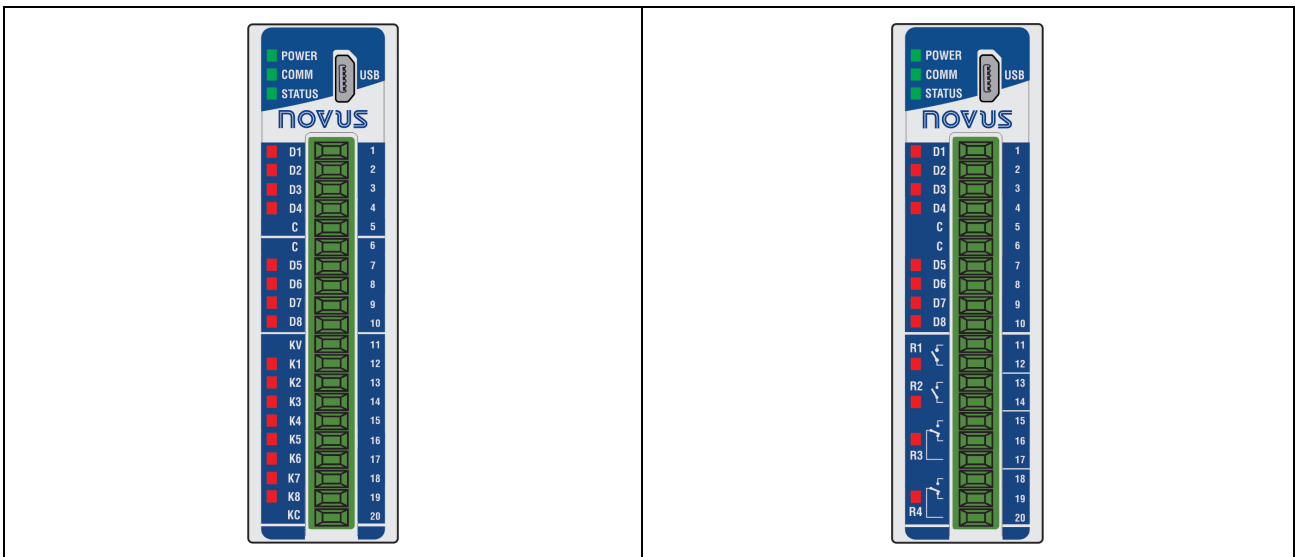


Fig. 05 – DO ETH Model

Fig. 06 – RL ETH Model

4. INSTALLATION

4.1 MECHANICAL INSTALLATION

The **DigiRail Connect** is designed to have its housing fixed to a 35 mm DIN rail, as shown in **Fig. 07**. The 35 mm DIN rail installation must be carried out after the device has been configured.

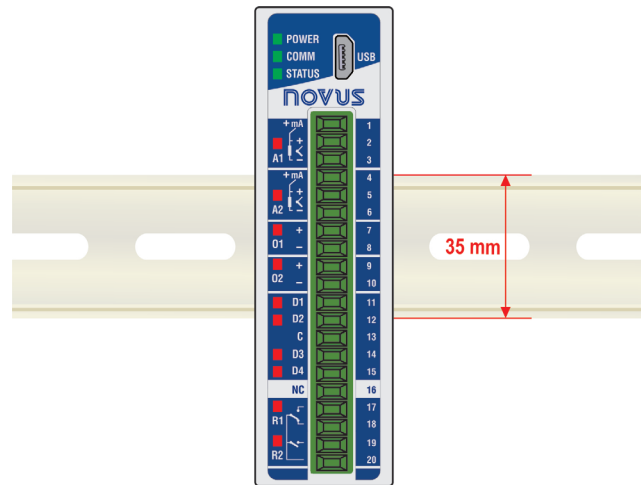


Fig. 07 – Mechanical installation

4.2 DIMENSION

DigiRail Connect has high quality housing, built in ABS+PC and with index of protection of IP20, which has the following dimensions:

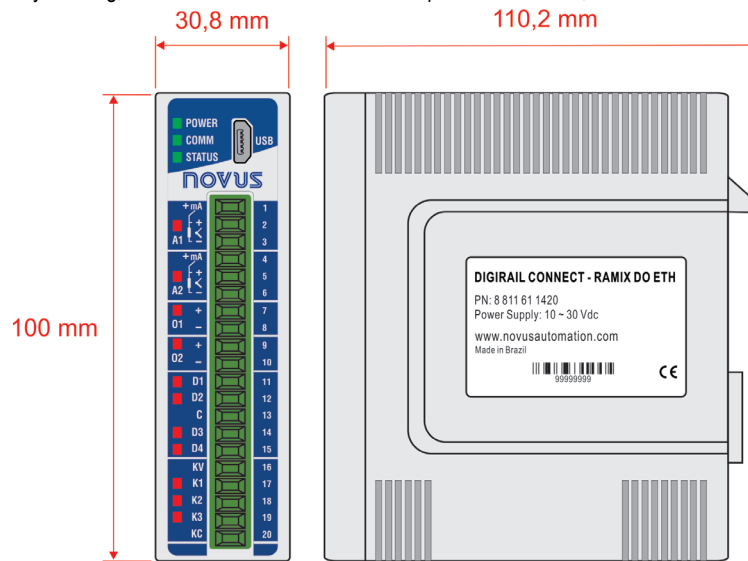


Fig. 08 – Dimension

4.3 INSTALLATION RECOMMENDATIONS

- Electronic and analog signal drivers must run the plant separately from the output and power leads. If possible, in grounded conduits.
- The power supply for the electronic instruments must come from a proper power grid for instrumentation.
- It is recommended to use RC FILTERS (noise suppressors) in contactor coils, solenoids, etc.
- In control applications, it is essential to consider what can happen when any part of the system fails. The device's internal security features do not guarantee full protection.
- The electrical connections must be made with the connection terminals marked on the device. Before connecting them, make sure that the connections have been made correctly.

5. CHARACTERISTICS AND CONNECTIONS

5.1 POWER SUPPLY CONNECTIONS AND COMMUNICATION PORTS

The power connections and communication ports can be viewed in the figure below:

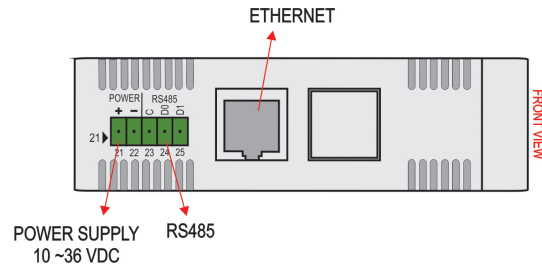


Fig. 09 – Power supply connections and communication ports

The **DigiRail Connect** power terminals are located at the bottom of the housing and the polarization of this connection must be observed: Terminal 21 (+) and Terminal 22 (-).

5.1.1 USB CONNECTION

On its front panel, **DigiRail Connect** provides a USB port, ideally intended for configuring and diagnosing the monitored process. During installation of the **NXperience** software, the USB port drivers will be automatically installed. During its first use, you must wait until Windows recognizes the **DigiRail Connect** driver.

The USB port is **NOT ISOLATED** from the Digital Input and Output circuits and the RS485 port circuit. The USB interface allows only the configuration of the device. The RS485 interface and the analog and digital inputs and outputs will only work when the power supply is connected.

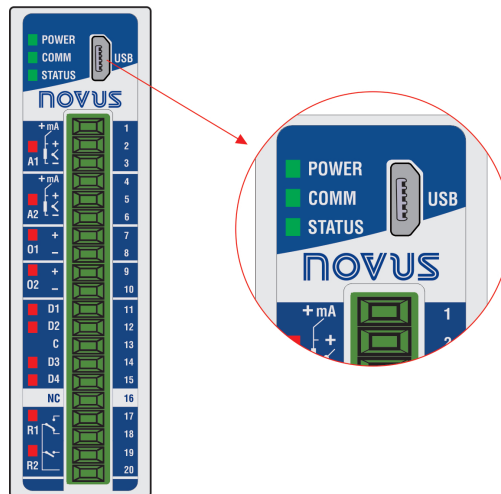


Fig. 10 – USB connection

5.1.2 RS485 CONNECTION

The RS485 connection interface is located on the back of **DigiRail Connect**, as shown in the figure below:

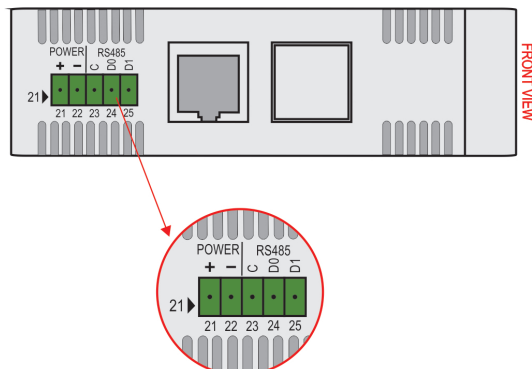


Fig. 11 – RS485 connection



The RS485 interface can be configured to operate at the following Baud Rates: 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200. It can also be configured to operate with 1 or 2 Stop Bits and parity even, odd and none.

More details about the implementation of a Modbus devices network via RS485 can be found in the document "Basic RS485 and RS422 Concepts", available in the website www.novusautomation.com.

The **Table 02** helps the connection of the RS485 communication interface connectors.

C				Optional connection which improves the communication performance.	Terminal 23
GND					
D0	D̄	D-	A	Inverted bidirectional data line.	Terminal 24
D1	D	D+	B	Bidirectional data line.	Terminal 25

Table 02 – RS485 connections

 	<p>The RS485 port IS NOT ISOLATED from the Digital Input and Output circuits and from the USB port circuit.</p>
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5.1.3 ETHERNET CONNECTION

The Ethernet interface is located on the back of **DigiRail Connect**, as shown in **Fig. 09**, and enables the communication of the device.

5.2 ELECTRICAL INSULATION

The electrical insulation of the **DigiRail Connect** can be seen in the figures below:

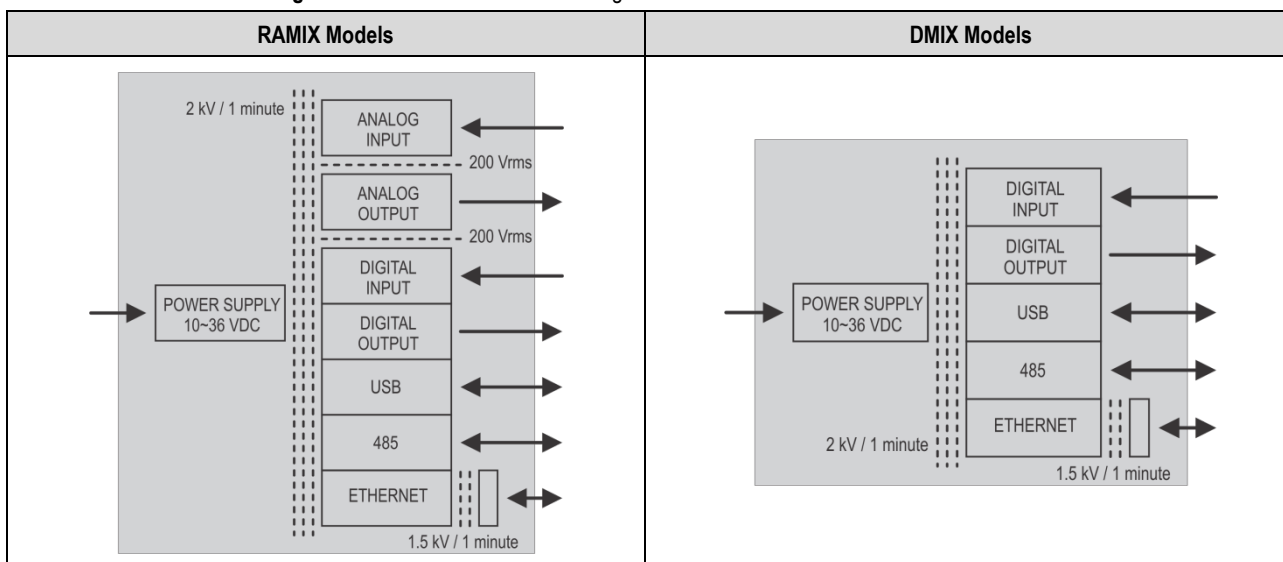


Fig. 12 – Electrical insulation

5.3 ANALOG INPUTS

DigiRail Connect has versions with 2 channels of analog inputs, identified as **A1** and **A2**, on its front panel. These channels are available only on RAMIX models and are suitable for measuring temperature or any other values represented by standard linear electrical signals.

Each channel can be configured through the **NXperience** configurator software (see the [Configuration Software](#) chapter).

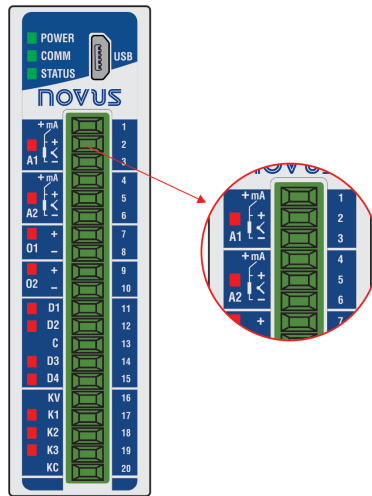


Fig. 13 – Analog inputs

The possible input types, along with their respective measuring ranges, are listed in **Table 03**:

TYPE	MEASURING RANGES
J	-110 to 950 °C (-166 to 1742 °F)
K	-150 to 1370 °C (-238 to 2498 °F)
T	-160 to 400 °C (-256 to 752 °F)
N	-270 to 1300 °C (-454 to 2372 °F)
R	-50 to 1760 °C (-58 to 3200 °F)
S	-50 to 1760 °C (-58 to 3200 °F)
B	400 to 1800 °C (752 to 3272 °F)
E	-90 to 730 °C (-130 to 1346 °F)
Pt100	-200 to 850 °C (-328 to 1562 °F)
Pt1000	-200 to 850 °C (-328 to 1562 °F)
NTC	-30 to 120 °C (-22 to 248 °F)
0 – 60 mV	Linear Analog Signals Configurable measuring range: - 65,535 to + 65,535 counts
0 – 5 Vdc	
0 – 10 Vdc	
0 – 20 mA	
4 – 20 mA	

Table 03 – Input types and sensor measurement ranges

Analog input channels **A1** and **A2** are not electrically isolated from each other, but are electrically isolated from other **DigiRail Connect** circuits.

For the **Temperature Sensors** group, the temperature unit setting is required. For the **Linear Analog Signals** group, the measurement range definition is required.

For all types of input signals, it is necessary to set values for the operating parameters of the **DigiRail Connect** analog input channels (see [Analog Inputs](#) section of the [Configuration Software](#) chapter):

- **Sampling Rate:** Allows you to set the number of readings performed each second by the analog input channel on the received input signal: 1 reading per second or 10 readings per second.
- **Filter:** Allows you to set the **Time Constant** value of a filter to be applied over the measured input signal. Parameter used to improve the stability of the measured signal. Adjustable between 0 and 1200 seconds.

5.3.1 A1 – A2 STATUS LEDS

When lit, the **A1** and **A2** status LEDs indicate that the respective channel is enabled, not reflecting the condition or value of the signal present at its terminals. In addition to indicating whether or not a channel is enabled, the LEDs also indicate when there is something wrong on the respective channel.

Improper conditions on the input channels are called "Error Condition" and are showed in specific paragraphs of this manual.

5.3.2 ANALOG INPUT ERROR CONDITION

It is called an "Error Condition" every condition of use or improper operation for the **DigiRail Connect** input channels. Many of the improper conditions are identified and then signaled by flashing the status LED of the respective channel.

The error conditions of the analog inputs are showed in **Table 04**.

INPUT TYPE	ERROR CONDITIONS
Temperature Sensors	<ul style="list-style-type: none"> Measures beyond the limits of the operating range; Open input / open signal.
0-20 mA	<ul style="list-style-type: none"> Measures above 22 mA (± 0.5 mA) (*).
0-5 / 0-10 V	<ul style="list-style-type: none"> Measures above 10% of the upper limit (*); Reverse polarity.
4-20 mA	<ul style="list-style-type: none"> Measurements below 3.5 mA (± 0.2 mA); Measures above 22 mA (± 0.5 mA); Open input / open signal; Reverse polarity.

Table 04 – Analog input error conditions

(*) No error indication when sensor is in open input / open signal.

5.3.3 CONNECTIONS OF ANALOG INPUTS

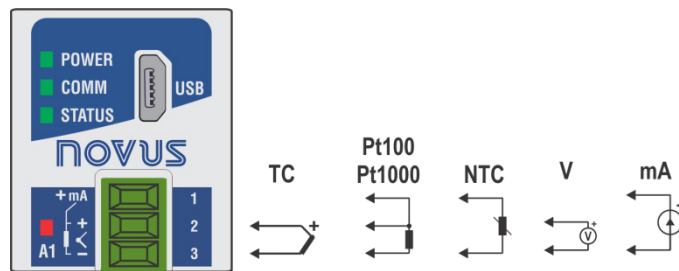


Fig. 14 – TC / Pt100 / Pt1000 / NTC / V / mA

5.4 DIGITAL INPUTS

DigiRail Connect has versions with 4 channels and 8 channels of digital inputs, identified as **D1 ... D4 ... D8**, on its front panel. These digital channels are suitable for receiving Dry Contact, NPN and PNP electrical signals.

Each channel can be configured through the **NXperience** configurator software (see the [Configuration Software](#) chapter).

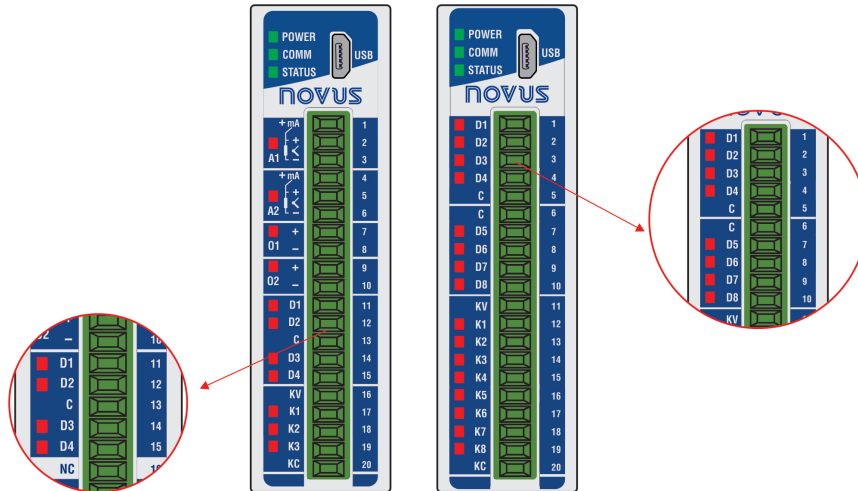


Fig. 15 – Digital inputs

The digital inputs can perform different functions, which will be defined during configuration (see [Digital Inputs](#) section of the [Configuration Software](#) chapter). The functions available are:

- **Logical Status:** When configured as **Logic Status**, allows the device to relate the voltage levels entered into the digital input to the logic states **0** and **1**.
 - **High Logic Level (1):** Voltages higher than 2.2 V;
 - **Low Logic Level (0):** Voltages lower than 1.5 V.
- **Counter:** Allows the digital input to count the number of pulses received at its terminals. As a reference for incrementing the count, you can use the rising edge (transition from **0** to **1**) or the falling edge (transition from **1** to **0**) of the received pulse.
- **Integrator ON/OFF:** Allows the sum (integration) of the time intervals measured with the digital input in logic state **0** to be performed and also the sum of the time intervals measured with the digital input in the logical state **1**. It will provide the two information separate. Value displayed in seconds.

In addition, the **Integrator ON/OFF** and the **Counter** functions have the **Preset** function, which allows you to set an initial value for the pulse count or the sum of the digital input ranges to **0** and **1**.

For the **Dry Contact** signal type, there is the **Debounce** feature, which allows defining a time interval to be disregarded by the digital input at each logical state transition.

5.4.1 D1 ... D8 STATUS LEDS

When lit, the **D1 ... D8** status LEDs indicate the logic state of the signal applied to the terminals of the respective digital input.

5.4.2 CONNECTIONS OF DIGITAL INPUTS

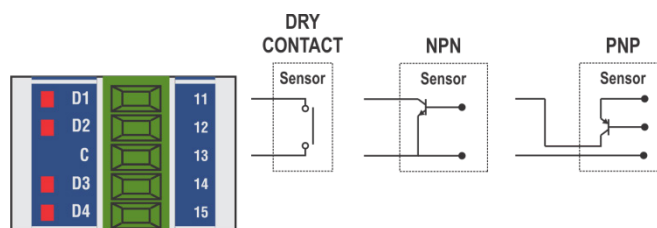


Fig. 16 – Dry Contact / NPN / PNP

5.5 ANALOG OUTPUTS

DigiRail Connect has a version with 2 channels of analog output, identified as **O1** and **O2**, on its front panel. These channels establish analog values of voltage or current according to the digital values received.

Each channel can be configured through the **NXperience** configurator software (see the [Configuration Software](#) chapter).

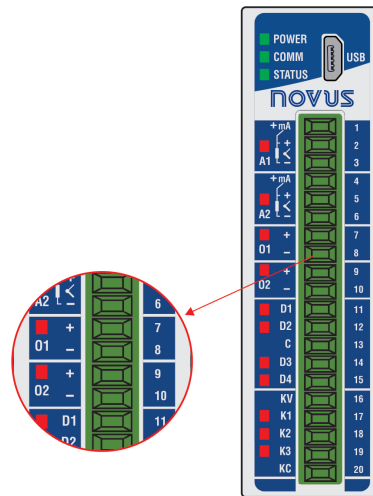


Fig. 17 – Analog Outputs

Analog output channels **O1** and **O2** are not electrically isolated from each other, but are electrically isolated from other **DigiRail Connect** circuits.

Analog outputs have three types of signals. There is no need to make any physical changes to the use any of the available output types. Simply set the desired option when configuring **DigiRail Connect** (see section [Analog Outputs](#) in the [Configuration Software](#) chapter):

- 0-20 mA;
- 4-20 mA;
- 0-10 V.

After setting the desired output type, you must use the **NXperience** configuration software to set other parameters for operation of the analog outputs in different situations.

- **Operating Range:** Allows you to set the operating range of the analog output:
 - **0.00 to 100.00 %:** The register that controls the analog output expects percentage values within the range 0 to 100 %, where:
 - **0.00 %:** Corresponds to the minimum value of the analog output (0 mA, 4 mA or 0 V);
 - **100.00 %:** Corresponds to the maximum value of the analog output (20 mA, 20 mA or 10 V).
 - **0 to 32 000:** The register that controls the analog output expects the 32 000 size, where:
 - **0:** Corresponds to the minimum value of the analog output (0 mA, 4 mA or 0 V);
 - **32000:** Corresponds to the maximum value of the analog output (20 mA, 20 mA or 10 V).
- **Power On State:** Allows you to set a initial value for the analog output when turning on the device and receiving a command. There are three possible options:
 - **Disabled:** Allows the analog output to remain off after device initialization and until a valid command is received.
 - **Configured Value:** Allows you to set the value to be adopted in the **Initial Value** parameter after the device initialization and until a valid command is received.
 - **Last Valid Value:** Allows the analog output to adopts the last valid value recorded.
- **Safe Value Watchdog:** Allows you to set a value for the analog output in case of loss of communication.

5.5.1 O1 – O2 STATUS LEDs

When lit, the **O1** and **O2** status LEDs indicate that the respective channel is enabled, not reflecting the condition or value of the signal present at its terminals.

5.5.2 CONNECTIONS OF ANALOG OUTPUTS



Fig. 18 – V / mA

5.6 DIGITAL OUTPUTS

DigiRail Connect has versions with transistor-sourcing digital output, identified as **K1 ... K8**, and with relay-type digital outputs, identified as **R1 ... R4**, on its front panel.

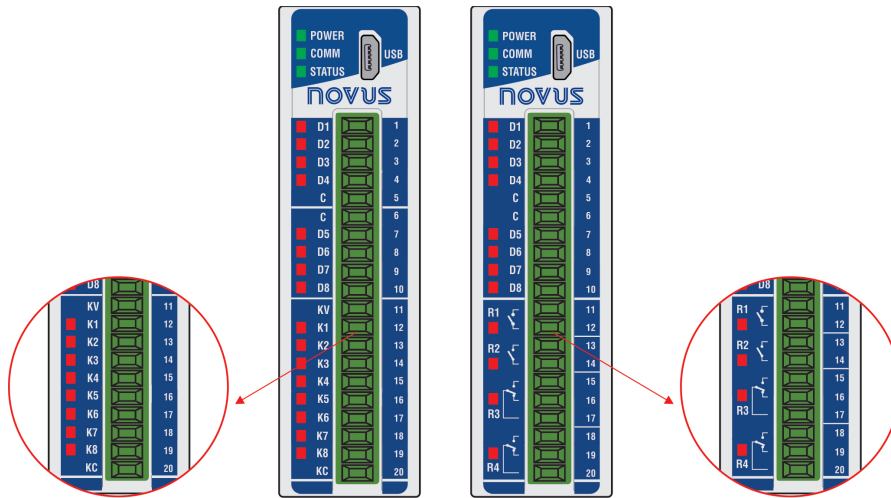


Fig. 19 – Digital outputs

DigiRail Connect has up to eight digital outputs (DOs), which obey commands received via digital communication. The registers of the **HR_DOx_VALUE** group are assigned to the digital outputs command. The writing of value **1** in these registers **ENABLES** the respective digital output. Writing the value **0**, in turn, corresponds to **DISABLES** the respective digital output.

It is important to note that the **ENABLE** output state does not necessarily imply that the output is **ON** or activated.

A group of parameters determines the operation of the digital outputs. These parameters are presented by the **NXperience** configuration software (see [Configuration Software](#) chapter), which allows you to define the most suitable configuration for your needs.

The parameters required for configuring the digital outputs are described below.

5.6.1 ACTUATION MODE

The digital output has three actuation modes:

- **Logical State:** The digital output reproduces the logical status of its respective status register of the **HR_DOx_VALUE** group.

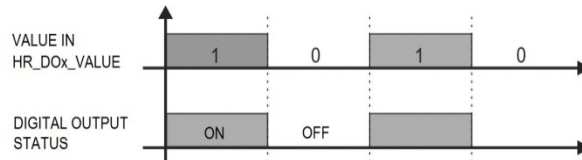


Fig. 20 – "Logical State" mode

- **Pulse:** With the status register receiving the value **1**, the output will turn on for a specific time interval (set in the **Pulse Duration** parameter) and then return to the **OFF** state.

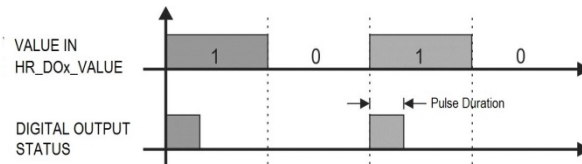


Fig. 21 – "Pulse" mode

The **ENABLE** output state does not necessarily imply that the output is **ON** or activated.

- **Pulse Train:** With the status register receiving the value **1**, the output will create a defined number of pulses (set in the **Number of Pulses** parameter), with a defined duration (set in the **Pulse Duration** parameter) and in a defined period (set in the **Repetition Period** parameter). After the pulse sequence, the digital output will return to the off state.

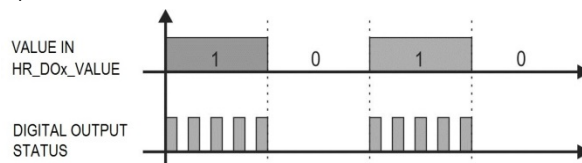


Fig. 22 – "Pulse Train" mode

The ENABLE output state does not necessarily imply that the output is ON or activated

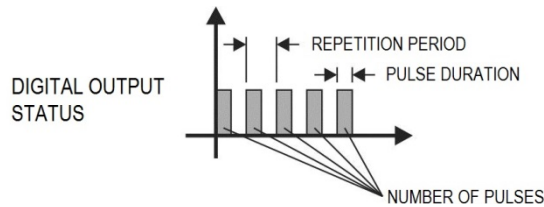


Fig. 23 – Digital output status

5.6.2 POWER ON STATE

It is the condition to be adopted by the digital output after the **DigiRail Connect** initialization and in which must remain until the receiving of a digital command that redefines its condition. There are three **Power On State** options:

- **Off:** Allows the digital output to remain off (0) after device initialization.
- **On:** Allows the digital output to start on (1) after device initialization.
- **Last Valid State:** Allows the digital output to adopt the last valid state registered.

5.6.3 SAFE STATE WATCHDOG

It allows you to set the condition to be adopted by the digital output when a command is interrupted due to a communication failure.

- **Off:** Allows the digital output to remain off until communication is restored.
- **On:** Allows the digital output to remain on until communication is restored.

5.6.4 K1 ... K8 / R1 ... R4 STATUS LEDs

When lit, the **K1 ... K8** and **R1 ... R4** status LEDs indicate that the respective channel is enabled (logic state 1).

5.6.5 CONNECTIONS OF DIGITAL TRANSISTOR OUTPUTS

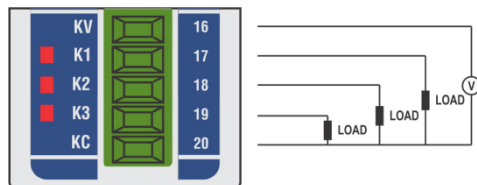


Fig. 24 – Transistor (Sourcing)

 	<p>The Transistor-type Digital Output channels are not electrically isolated from the Digital Input channels, but are isolated from the other DigiRail Connect electrical circuits.</p>
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5.6.6 CONNECTIONS OF DIGITAL RELAY OUTPUTS

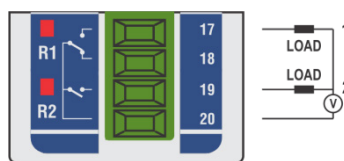


Fig. 25 – Relay

5.7 LEDS

5.7.1 OPERATION LED

POWER

It indicates whether or not the device is electrically powered.

5.7.2 RS485 COMMUNICATION LED

COMM

If the LED is blinking, it indicates that communication is in progress via the RS485 interface. If the LED is off, it indicates that the device is not communicating via the RS485 interface.

5.7.3 GENERAL STATUS LED

STATUS

If the LED is blinking, it indicates that there is a problem with some channel or some configuration sent to the device. The LED will also blink if any input or output is forced with any value (see [DIAGNOSTICS](#) section in [CONFIGURATION SOFTWARE](#) chapter). Otherwise, it will remain lit.

5.7.4 STATUS LED OF EACH CHANNEL

The operation of the status LED of each channel can be viewed in the respective channel section of it within this chapter.

6. MODBUS PROTOCOL

DigiRail Connect is compatible with the Modbus protocol, a data communication protocol used to connect the device to system control and data acquisition (SCADA).

6.1 COMMANDS

6.1.1 READ HOLDING REGISTERS – 0x03

This command can be used to read the value of one or even the maximum number of consecutive registers.

6.1.2 WRITE HOLDING REGISTERS – 0x06

This command can be used to write in a register.

6.1.3 WRITE MULTIPLE HOLDING REGISTERS – 0x16

This command can be used to write in multiple registers.

6.2 REGISTERS TABLE

Following is the table of registers supported by the device:

MODBUS ADDRESS	REGISTER	DESCRIPTION
0	HR_NUM_SERIE_LO	Device serial number (2 registers).
1	HR_NUM_SERIE_HI	
2	HR_HW_SET_LO	Hardware configuration. There are two 16-bit registers. Each of the bits represents the presence of a device or channel: <div style="text-align: center;"> 2 HR_HW_SET_LO 3 HR_HW_SET_HI </div> The lower part (HR_HW_SET_LO) is composed of bits from 0 to 15. The upper part (HR_HW_SET_HI) is composed of bits from 16 to 31. BIT 0: DI0: Digital Input 1; BIT 1: DI1: Digital Input 2; BIT 2: DI2: Digital Input 3; BIT 3: DI3: Digital Input 4; BIT 4: DI4: Digital Input 5; BIT 5: DI5: Digital Input 6; BIT 6: DI6: Digital Input 7; BIT 7: DI7: Digital Input 8. BIT 8: DO0: Digital Output 1; BIT 9: DO1: Digital Output 2; BIT10: DO2: Digital Output 3; BIT11: DO3: Digital Output 4; BIT12: DO4: Digital Output 5; BIT13: DO5: Digital Output 6; BIT14: DO6: Digital Output 7; BIT15: DO7: Digital Output 8. BIT16: DO0_Relay: Relay Output 1; BIT17: DO1_Relay: Relay Output 2; BIT18: DO2_Relay: Relay Output 3; BIT19: DO3_Relay: Relay Output 4; BIT20: DO4_Relay: Relay Output 5; BIT21: DO5_Relay: Relay Output 6; BIT22: DO6_Relay: Relay Output 7; BIT23: DO7_Relay: Relay Output 8.
3	HR_HW_SET_HI	

MODBUS ADDRESS	REGISTER	DESCRIPTION
		BIT24: AO0: Analog Output 1; BIT25: AO1: Analog Output 2. BIT26: AI0: Analog Input 1; BIT27: AI1: Analog Input 2. BIT28: Ethernet: Ethernet Interface; BIT29: CAN: CAN Interface; BIT30: RS485: RS485 Interface; BIT31: b31: Reserved.
4	HR_ETH_MAC0	Ethernet interface MAC address: 6H:6L:5H:5L:4H:4L
5	HR_ETH_MAC1	
6	HR_ETH_MAC2	
7	HR_TS_CALIB0	Date of last calibration (Unix Timestamp; UTC).
8	HR_TS_CALIB1	
9	HR_TS_CALIB2	
10	HR_TS_CALIB3	
11	HR_VERSAO_FW	Firmware version.
12	HR_ID	Identification code: 0x0300 (hexadecimal).
14	HR_AI1_LO	Value read from A1 input.
15	HR_AI1_HI	
16	HR_AI2_LO	Value read from A2 input.
17	HR_AI2_HI	
18	HR_AO1_LO	Current value of O1 output.
19	HR_AO1_HI	
20	HR_AO2_LO	Current value of O2 output.
21	HR_AO2_HI	
22	HR_COUNTER1_LO	Current value from counter of D1 input.
23	HR_COUNTER1_HI	
24	HR_COUNTER2_LO	Current value from counter of D2 input.
25	HR_COUNTER2_HI	
26	HR_COUNTER3_LO	Current value from counter of D3 input.
27	HR_COUNTER3_HI	
28	HR_COUNTER4_LO	Current value from counter of D4 input.
29	HR_COUNTER4_HI	
30	HR_COUNTER5_LO	Current value from counter of D5 input.
31	HR_COUNTER5_HI	
32	HR_COUNTER6_LO	Current value from counter of D6 input.

MODBUS ADDRESS	REGISTER	DESCRIPTION
33	HR_COUNTER6_HI	
34	HR_COUNTER7_LO	Current value from counter of D7 input.
35	HR_COUNTER7_HI	
36	HR_COUNTER8_LO	Current value from counter of D8 input.
37	HR_COUNTER8_HI	
38	HR_DI1_TIME_ON_LO	Current value of time integrator "ON" of D1 input.
39	HR_DI1_TIME_ON_HI	
40	HR_DI2_TIME_ON_LO	Current value of time integrator "ON" of D2 input.
41	HR_DI2_TIME_ON_HI	
42	HR_DI3_TIME_ON_LO	Current value of time integrator "ON" of D3 input.
43	HR_DI3_TIME_ON_HI	
44	HR_DI4_TIME_ON_LO	Current value of time integrator "ON" of D4 input.
45	HR_DI4_TIME_ON_HI	
46	HR_DI5_TIME_ON_LO	Current value of time integrator "ON" of D5 input.
47	HR_DI5_TIME_ON_HI	
48	HR_DI6_TIME_ON_LO	Current value of time integrator "ON" of D6 input.
49	HR_DI6_TIME_ON_HI	
50	HR_DI7_TIME_ON_LO	Current value of time integrator "ON" of D7 input.
51	HR_DI7_TIME_ON_HI	
52	HR_DI8_TIME_ON_LO	Current value of time integrator "ON" of D8 input.
53	HR_DI8_TIME_ON_HI	
54	HR_DI1_TIME_OFF_LO	Current value of time integrator "OFF" of D1 input.
55	HR_DI1_TIME_OFF_HI	
56	HR_DI2_TIME_OFF_LO	Current value of time integrator "OFF" of D2 input.
57	HR_DI2_TIME_OFF_HI	
58	HR_DI3_TIME_OFF_LO	Current value of time integrator "OFF" of D3 input.
59	HR_DI3_TIME_OFF_HI	
60	HR_DI4_TIME_OFF_LO	Current value of time integrator "OFF" of D4 input.
61	HR_DI4_TIME_OFF_HI	
62	HR_DI5_TIME_OFF_LO	Current value of time integrator "OFF" of D5 input.
63	HR_DI5_TIME_OFF_HI	
64	HR_DI6_TIME_OFF_LO	Current value of time integrator "OFF" of D6 input.
65	HR_DI6_TIME_OFF_HI	
66	HR_DI7_TIME_OFF_LO	Current value of time integrator "OFF" of D7 input.

MODBUS ADDRESS	REGISTER	DESCRIPTION
67	HR_DI7_TIME_OFF_HI	
68	HR_DI8_TIME_OFF_LO	Current value of time integrator "OFF" of D8 input.
69	HR_DI8_TIME_OFF_HI	
70	HR_INPUT1_STATE	Status of D1 input.
71	HR_INPUT2_STATE	Status of D2 input.
72	HR_INPUT3_STATE	Status of D3 input.
73	HR_INPUT4_STATE	Status of D4 input.
74	HR_INPUT5_STATE	Status of D5 input.
75	HR_INPUT6_STATE	Status of D6 input.
76	HR_INPUT7_STATE	Status of D7 input.
77	HR_INPUT8_STATE	Status of D8 input.
78	HR_OUTPUT1_STATE	Current status of K1/R2 output.
79	HR_OUTPUT2_STATE	Current status of K2/R2 output.
80	HR_OUTPUT3_STATE	Current status of K3/R3 output.
81	HR_OUTPUT4_STATE	Current status of K4/R4 output.
82	HR_OUTPUT5_STATE	Current status of K5 output.
83	HR_OUTPUT6_STATE	Current status of K6 output.
84	HR_OUTPUT7_STATE	Current status of K7 output.
85	HR_OUTPUT8_STATE	Current status of K8 output.
94	HR_INTERNAL_TEMP	Cold Junction temperature value. Thus, the Cold Junction will be compensated for thermocouple measurements.
98	HR_STATUS_AI_CH1	Channel A1 status LED.
99	HR_STATUS_AI_CH2	Channel A2 status LED.
132	HR_INFO_ETH_IPV4_LO	IPv4 Address. Example: IP=192.168.0.1: HR_INFO_ETH_IPV4_HI=0xC0A8 (hexadecimal); HR_INFO_ETH_IPV4_LO=0x0001 (hexadecimal).
133	HR_INFO_ETH_IPV4_HI	
134	HR_INFO_ETH_IPV4_SBNT_MSK_LO	IPv4 Subnet Mask (same IP address format).
135	HR_INFO_ETH_IPV4_SBNT_MSK_HI	
136	HR_INFO_ETH_IPV4_DFLT_GTWY_LO	IPv4 Default Gateway (Same IP address format).
137	HR_INFO_ETH_IPV4_DFLT_GTWY_HI	
140	HR_TOTAL_SOCKETS	Number of available sockets.
141	HR_SOCKETS_IN_USE	Number of sockets in use.
142	HR_GENERAL_ERROR_LO	Ethernet interface error counter.
143	HR_GENERAL_ERROR_HI	
144	HR_RELISTEN_ERROR_LO	Relisten error counter.
145	HR_RELISTEN_ERROR_HI	

MODBUS ADDRESS	REGISTER	DESCRIPTION
146	HR_SOCKET_SWITCH_ERROR_LO	Socket switching error counter.
147	HR_SOCKET_SWITCH_ERROR_HI	
148	HR_DISCONNECT_ERROR_LO	Disconnect error counter.
149	HR_DISCONNECT_ERROR_HI	
150	HR_SOCKET_CREATION_ERROR_LO	Sockets creation error counter.
151	HR_SOCKET_CREATION_ERROR_HI	
152	HR_SOCKET_DELETE_ERROR_LO	Sockets erase error counter.
153	HR_SOCKET_DELETE_ERROR_HI	
154	HR_IP_INVALID_PACKETS_LO	Number of invalid packets received.
155	HR_IP_INVALID_PACKETS_HI	
156	HR_PACKETS_SENT_LO	Number of packets sent.
157	HR_PACKETS_SENT_HI	
158	HR_PACKETS_RECEIVED_LO	Number of packets received.
159	HR_PACKETS_RECEIVED_HI	
500	HR_DO1_VALUE	Output K1/R1 status-handling register.
501	HR_DO2_VALUE	Output K2/R2 status-handling register.
502	HR_DO3_VALUE	Output K3/R3 status-handling register.
503	HR_DO4_VALUE	Output K4/R4 status-handling register.
504	HR_DO5_VALUE	Output K5 status-handling register.
505	HR_DO6_VALUE	Output K6 status-handling register.
506	HR_DO7_VALUE	Output K7 status-handling register.
507	HR_DO8_VALUE	Output K8 status-handling register.
508	HR_DO1_STATE_TO_FORCE	Forcing value of K1/R1 output.
509	HR_DO1_FORCE_STATE	Enable forcing of K1/R1 output.
510	HR_DO2_STATE_TO_FORCE	Forcing value of K2/R2 output.
511	HR_DO2_FORCE_STATE	Enable forcing of K2/R2 output.
512	HR_DO3_STATE_TO_FORCE	Forcing value of K3/R3 output.
513	HR_DO3_FORCE_STATE	Enable forcing of K3/R3 output.
514	HR_DO4_STATE_TO_FORCE	Forcing value of K4/R4 output.
515	HR_DO4_FORCE_STATE	Enable forcing of K4/R4 output.
516	HR_DO5_STATE_TO_FORCE	Forcing value of K5 output.
517	HR_DO5_FORCE_STATE	Enable forcing of K5 output.
518	HR_DO6_STATE_TO_FORCE	Forcing value of K6 output.
519	HR_DO6_FORCE_STATE	Enable forcing of K6 output.

MODBUS ADDRESS	REGISTER	DESCRIPTION
520	HR_DO7_STATE_TO_FORCE	Forcing value of K7 output.
521	HR_DO7_FORCE_STATE	Enable forcing of K7 output.
522	HR_DO8_STATE_TO_FORCE	Forcing value of K8 output.
523	HR_DO8_FORCE_STATE	Enable forcing of K8 output.
524	HR_AO1_VALUE	Register of manipulation of values applied by output O1.
525	HR_AO2_VALUE	Register of manipulation of values applied by output O2.
526	HR_AO1_VALUE_TO_FORCE	Forcing value of O1 output.
527	HR_AO1_FORCE_VALUE	Enable forcing of O1 output.
528	HR_AO2_VALUE_TO_FORCE	Forcing value of O2 output.
529	HR_AO2_FORCE_VALUE	Enable forcing of O2 output.
1530	HR_DI1_FORCE_LO	Forcing value for D1 input (logical state, counter or time integrator).
1531	HR_DI1_FORCE_HI	
1533	HR_DI1_FORCE	Enable forcing of D1 input.
1580	HR_DI2_FORCE_LO	Forcing value of D2 input (logical state, counter or time integrator).
1581	HR_DI2_FORCE_HI	
1583	HR_DI2_FORCE	Enable forcing of D2 input.
1630	HR_DI3_FORCE_LO	Forcing value of D3 input (logical state, counter or time integrator).
1631	HR_DI3_FORCE_HI	
1633	HR_DI3_FORCE	Enable forcing of D3 input.
1680	HR_DI4_FORCE_LO	Forcing value of D4 input (logical state, counter or time integrator).
1681	HR_DI4_FORCE_HI	
1683	HR_DI4_FORCE	Enable forcing of D4 input.
1730	HR_DI5_FORCE_LO	Forcing value of D5 input (logical state, counter or time integrator).
1731	HR_DI5_FORCE_HI	
1733	HR_DI5_FORCE	Enable forcing of D5 input.
1780	HR_DI6_FORCE_LO	Forcing value of D6 input (logical state, counter or time integrator).
1781	HR_DI6_FORCE_HI	
1783	HR_DI6_FORCE	Enable forcing of D6 input.
1830	HR_DI7_FORCE_LO	Forcing value of D7 input (logical state, counter or time integrator).
1831	HR_DI7_FORCE_HI	
1833	HR_DI7_FORCE	Enable forcing of D7 input.
1880	HR_DI8_FORCE_LO	Forcing value of D8 input (logical state, counter or time integrator).
1881	HR_DI8_FORCE_HI	
1883	HR_DI8_FORCE	Enable forcing of D8 input.

MODBUS ADDRESS	REGISTER	DESCRIPTION
2333	HR_AI1_FORCE_VALUE	Enable forcing of A1 input.
2334	HR_AI1_FORCED_LO	Forcing value of A1 input (32 bits).
2335	HR_AI1_FORCED_HI	
2383	HR_AI2_FORCE_VALUE	Enable forcing of A2 input.
2384	HR_AI2_FORCED_LO	Forcing value of A2 input (32 bits).
2385	HR_AI2_FORCED_HI	

Table 05 – Registers Table

7. CONFIGURATION SOFTWARE

7.1 NXPERIENCE

NXperience software allows you to configure and analyze **DigiRail Connect** data. With the software, you can explore all the features of the device, communicating through its USB interface.

In addition, **NXperience** allows you to force values into the analog and digital inputs and outputs and perform analysis of information about the Ethernet interface and device status.

NXperience is the most complete configuration tool for the new line of **NOVUS** devices. The software can be downloaded free of charge from our website www.novus.com.br, in the Downloads area.

7.2 CONFIGURING DIGIRAIL CONNECT WITH NXPERIENCE

You can configure **DigiRail Connect** by clicking the **Configure** button located on the **NXperience** home screen. The following sections describe each of the configuration parameters and their particularities.

7.2.1 GENERAL DEVICE INFORMATION

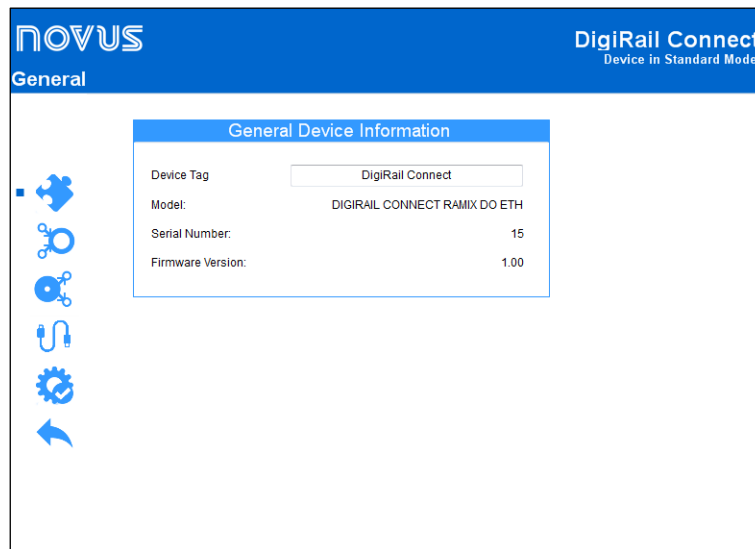


Fig. 26 – General parameters

- **Device Tag:** It allows you to set a name, which will be used as an identifier, for the device. The field allows up to 24 characters.
- **Model:** It displays the device model.
- **Serial Number:** It displays the unique device identification number.
- **Firmware Version:** It displays the firmware version recorded on the device.

7.2.2 ANALOG INPUTS

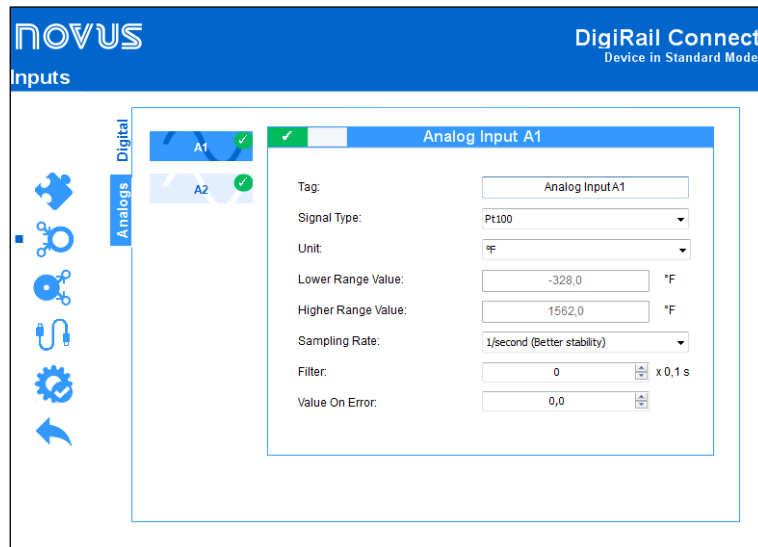


Fig. 27 – Analog input

- **Tag:** It allows you to set a name, which will be used as an identifier, for analog input. The field allows up to 24 characters.
- **Signal Type:** It allows you to configure the type of sensor to be used for each analog input.
- **Unit:** It allows you to configure the unit of each analog input. In the case of temperature sensors, it is possible to select the °C or °F units.
- **Lower Range Value:** With lineal signals, it allows you to set a lower value for the range -65.535 to 65.535.
- **Upper Range Value:** With lineal signals, it allows you to set a higher value for the range -65.535 to 65.535.
- **Sampling Rate:** It allows you to set a sampling rate of 1 per second (which gives you better stability) or 10 per second (which gives you worst stability).
- **Filter:** It allows you to define a filter for the selected analog input.
- **Value on Error:** It allows you to define a value to be displayed when there is an error in the configured input.

7.2.3 DIGITAL INPUTS

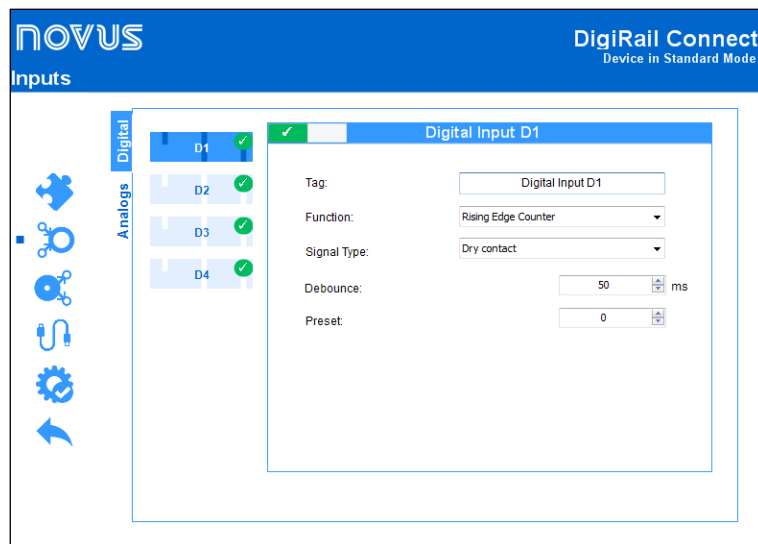


Fig. 28 – Digital inputs

- **Tag:** It allows you to set a name, which will be used as an identifier, for digital input. The field allows up to 24 characters.
- **Function:** It allows you to select the function to be performed by the digital input.
 - **Logical Status:** It allows you to read the logic state of the signal applied to the digital input.
 - **High Logic Level (1):** Voltages higher than 2.2 V;
 - **Low Logic Level (0):** Voltages lower than 1.5 V.
 - **Rising Edge Counter:** It allows you to count the number of pulses received at the Rising edge. Up to 250 Hz.
 - **Falling Edge Counter:** It allows you to count the number of pulses received at the Falling Edge. Up to 250 Hz.
 - **Integrator ON/OFF:** It allows the time intervals of the digital input to be integrated into a recorder and, in another register, the time intervals of the connected digital input. Amount accounted in seconds.
- **Signal Type:** It allows you to configure the type of sensor to be used.

- **Debounce:** It allows you to set a time to be disregarded by the counter after detecting the edge at the input. Functionality available when selecting the sensor type Dry Contact. Interval limited to 10 s (10 000 ms) maximum.
- **Preset:** It allows you to set an initial value for the Rising Edge, Falling Edge, and Integrator ON/OFF counters.

7.2.4 ANALOG OUTPUTS

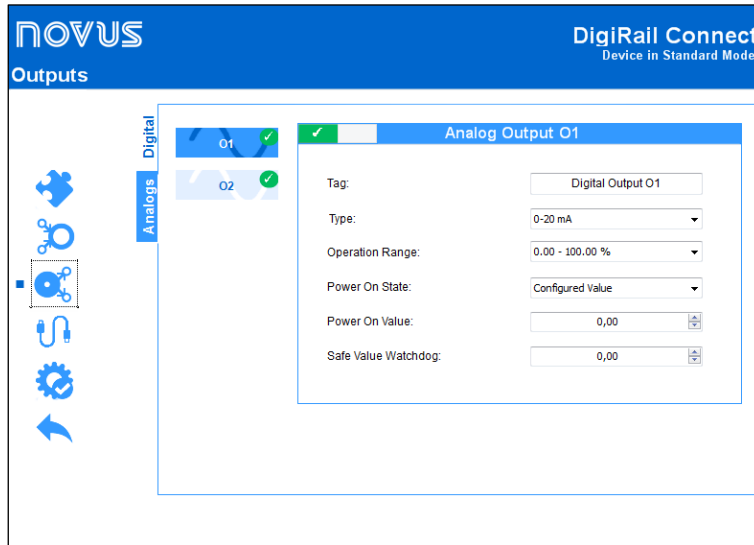


Fig. 29 – Analog outputs

- **Tag:** It allows you to set a name, which will be used as an identifier, for the analog output. The field allows up to 24 characters.
- **Operating Range:** It allows you to set the analog output scale, which can be
- **Power On State:** It allows you to set a value for the analog output when the device is turned on and before an analog output value setting command is received. There are three possible options:
 - **Disabled:** It allows the analog output to remain off after device initialization and until a valid command is received.
 - **Configured Value:** It allows you to set the value to be adopted in the **Initial Value** parameter after the device initialization and until a valid command is received.
 - **Power On Value:** It allows you to set the value to be adopted by the analog output after the device initialization. This parameter is directly related to the chosen operating range and can be any value within the range 0 to 100 % or 0 to 32.000 counts.
 - **Last Valid Value:** It allows determining that, after the device initialization, the analog output adopts the last valid value applied from the respective value manipulation registers provided by (HR_AO "x"_VALUE).
- **Safe Value Watchdog:** It allows you to set a value to be adopted by the analog output in case of loss of Ethernet and/or RS485 communication.

7.2.5 DIGITAL OUTPUTS

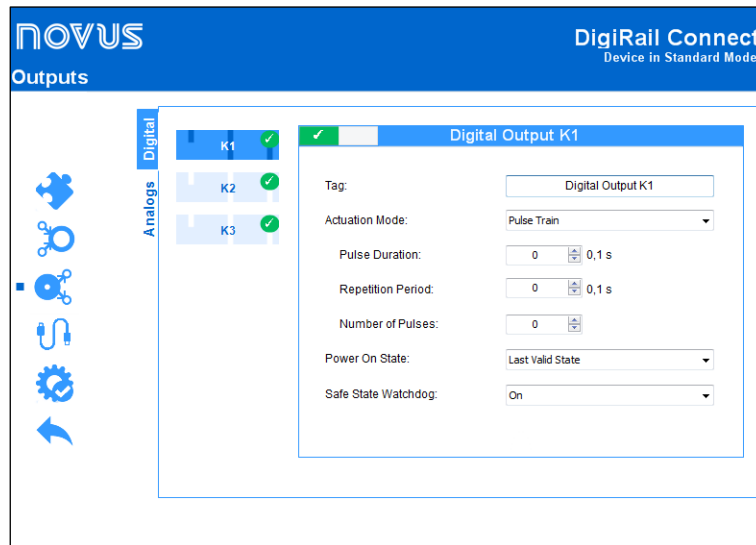


Fig. 30 – Digital outputs

- **Tag:** It allows you to set a name, which will be used as an identifier, for the digital output. The field allows up to 24 characters.
- **Actuation Mode:** It allows you to define the mode of operation of the digital output.
 - **Logical State:** When selected, it allows the value 0 or 1 to be applied to the configured digital output.
 - **Pulse:** When selected, it allows the digital output to be turned on for a set time (defined in the **Pulse Duration** parameter) and after that period returns to the off condition.
 - **Pulse Duration:** It allows you to set the pulse duration and how long the digital output will remain on.
 - **Pulse Train:** When selected, it allows the digital output to generate a defined pulse sequence.
 - **Pulse Duration:** It allows you to set the pulse duration and how long the digital output will remain on.
 - **Repetition Period:** It allows you to define the repetition period of the pulse train, which consists of the interval between the pulses.
 - **Number of Pulses:** It allows you to set the number of pulses to be applied in the configured range.
- **Power On State:** It allows you to set the initial state of the device's analog output after initializing the device until a command is acknowledged.
 - **Off:** It allows the digital output to remain off (0) after device initialization.
 - **On:** It allows the digital output to start on (1) after device initialization.
 - **Last Valid State:** It allows the digital output to adopt the last valid state registered.
- **Safe State Watchdog:** It allows you to set the condition to be adopted by the digital output when a command is interrupted due to a communication failure.
 - **Off:** It allows the digital output to remain off until communication is restored.
 - **On:** It allows the digital output to remain on until communication is restored.

7.2.6 COMMUNICATION PARAMETERS

7.2.6.1 ETHERNET

The screenshot displays the 'Communication' configuration page for a DigiRail Connect device. The interface is organized into several sections:

- Ethernet Interface:** A toggle switch is set to 'Enabled'. The 'Obtaining Address' dropdown is set to 'Static'. The IP Address, Subnet Mask, and Default Gateway fields are all set to 0.0.0.0.
- Modbus TCP:** A separate configuration box containing a 'Port' dropdown set to 502, an 'Address' dropdown set to 1, and a 'Gateway Timeout' dropdown set to 0.
- Safe State Watchdog:** A toggle switch is set to 'Enabled'. The 'Timeout' dropdown is set to 10 ms. There are checkboxes for 'RS485' and 'Ethernet', both of which are checked.

Fig. 31 – Communication: Ethernet

INTERNET INTERFACE

- **Ethernet:** It allows you to enable or disable the Ethernet interface.
- **Obtaining Address:** It allows you to define how **DigiRail Connect** will obtain an IP: **DHCP** (Dynamic Host Configuration Protocol), which allows the IP (Internet Protocol) of the device to be assigned by the network server, or **Static**, which allows the user sets the IP address, subnet mask, and default gateway for the connection.
- **IP Address:** It allows you to enter the IP, which refers to the identification of the device in a local or public network, to be used by the device. This is a required field when the **Obtaining Address** parameter is marked **Static**.
- **Subnet Mask:** Also known as subnet mask or netmask, it allows you to divide a specific network into smaller subnets, making it more effective to use a certain IP address space. This is a required field when the **Obtaining Address** parameter is marked **Static**.
- **Default Gateway:** It allows you to enter a default gateway, which refers to the device address on the network that connects your computers to the Internet, to the device. This is a required field when the **Obtaining Address** parameter is marked **Static**.

MODBUS TCP

- **Port:** It allows you to define the TCP port on which the service will be available.
- **Address:** It allows you to set the Modbus address to be adopted by the device, so that it can communicate on a Modbus network.
- **Gateway Timeout:** It allows you to set the timeout (in milliseconds) of the gateway. This is a required field when the **Modbus Operation Mode** parameter of the **RS485** tab (see section [RS485](#)) is selected as the Gateway.

The screenshot shows the 'Communication' configuration page for 'DigiRail Connect' in 'Device in Standard Mode'. On the left, a vertical navigation menu includes icons for Ethernet, RS485, and a back arrow. The main content area is divided into two sections. The top section, titled 'RS485', contains five configuration fields: 'Modbus Operation Mode' (set to 'Slave'), 'Modbus Address' (set to '1'), 'Baud Rate' (set to '19200'), 'Parity' (set to 'None'), and 'Stop Bits' (set to '1'). The bottom section, titled 'Safe State Watchdog', features a 'Watchdog' toggle switch set to 'Enabled', a 'Timeout' field set to '10 ms', and two checked checkboxes for 'RS485' and 'Ethernet'.

Fig. 32 – Communication: RS485

- **Modbus Operation Mode:** It allows you to set the Modbus operation mode of the RS485 interface: **Slave** or **Gateway**.
- **Modbus Address:** It allows you to set the Modbus address to be used by the device, so that it can communicate on a Modbus network. This is an editable field when the **Modbus Operation Mode** parameter is selected as **Slave**. Allows an address between 1 and 247.
- **Baud Rate:** It allows you to set the Baud Rate to be used by the Modbus network.
- **Parity:** It allows you to set the parity to be used by the Modbus network: even, odd or none.
- **Stop Bits:** It allows you to set the number of Stop Bits to be used by the Modbus network.

GATEWAY MODE OPERATION

You can configure **DigiRail Connect** to operate in Gateway mode between a Modbus TCP network and a Modbus RTU network. **DigiRail Connect** will allow a Modbus TCP client on the Modbus TCP network (a PLC or a SCADA system via **Ethernet**, for example) to communicate with devices from a Modbus RTU network in RS485.

Along with the Ethernet interface configuration, there is a configuration of Modbus TCP where, in addition to the port, you can configure the RTU address of the **DigiRail Connect** and, if it is enabled, you can also configure the timeout of the Modbus TCP/RTU gateway. All Modbus TCP requests received by **DigiRail Connect** with a different Modbus RTU address than the address configured in the device will be converted to the Modbus RTU protocol and retransmitted in the RS485 network. Responses to these requests will be reconverted to the Modbus TCP protocol and relayed over the Ethernet network to the requesting Modbus TCP client.

The **Gateway** mode adapts the protocol to the physical environment and is transparent to the Modbus TCP client.

7.2.6.3 SAFE STATE WATCHDOG

- **Watchdog:** It allows you to enable or disable the Watchdog function.
- **Timeout:** It allows you to enter a period of time (in ms) to activate the Watchdog function. If there is a loss of communication and once the timeout time set in this parameter has passed, the analogue or digital output will receive the value previously set in the **Safe State Watchdog** parameter. This parameter can be configured with a minimum value of 10 ms and a maximum value of 65535 ms.
- **RS485:** If selected, it allows the Watchdog function to act on the RS485 interface.
- **Ethernet:** If selected, allows the Watchdog function to act on the Ethernet interface.

7.3 DIAGNOSTICS

You can view the **DigiRail Connect** diagnostics tab by clicking the **Diagnostics** button located on the **NXperience** home screen. In addition to providing an analysis of the communication status of the device, this tab also allows you to force specific values for each channel.

The following sections describe each of the configuration passable parameters and their particularities.

7.3.1 FORCING DIGITAL INPUTS

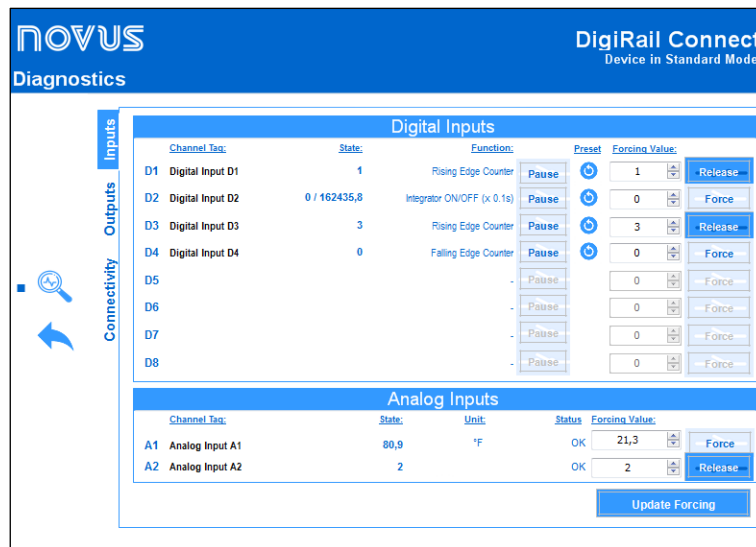







Fig. 33 – Diagnostics: Inputs

- **Channel Tag:** It displays the channel tag, defined in the **Tag** parameter of each digital input.
- **State:** It displays the current value displayed by the channel.
- **Function:** It displays the function configured for each channel, defined in the **Function** parameter of each digital input.
 - **Pause:** Available for **Counter** and **Integrator** functions. Allows pausing the counter/integrator value. This button is used to pause and to resume the counter/integrator.
- **Preset:** It allows you, when clicking the  button, to apply to the channel the value previously configured in the **Preset** parameter of the digital input.
- **Forcing Value:** It allows you to force a specific value for each digital input channel by entering the desired value and clicking the  button. When executing this function, the **State** parameter will adopt the forced value. To stop forcing, just click the  button.
- **Update Forcing:** It allows you to update the forcing values of the already forced channels by clicking the respective button.

7.3.2 FORCING ANALOG INPUTS

- **Channel Tag:** It displays the channel tag, defined in the **Tag** parameter of each analog output.
- **State:** It displays the current value displayed by the channel.
- **Unit:** It displays the unit configured for each analog input, set in the **Unit** parameter of each analog input.
- **Status:** It displays the status of each analog input. **OK** means there is no error in the analog input. **NOK** means there is an error in the analog input.
- **Forcing Value:** It allows you to force a specific value for each digital input channel by entering the desired value and clicking the  button. When executing this function, the **State** parameter will adopt the forced value. To stop forcing, just click the  button.
- **Update Forcing:** It allows you to update the forcing values of the already forced channels by clicking the respective button.

7.3.3 FORCING DIGITAL OUTPUTS

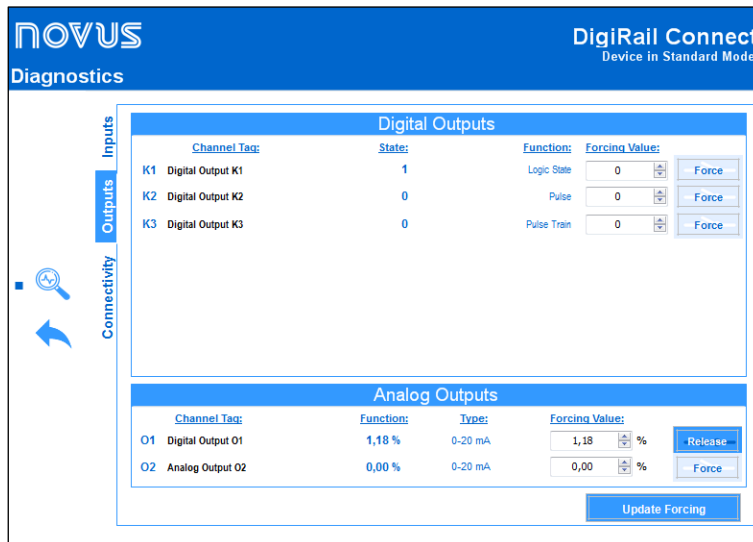


Fig. 34 – Diagnostics: Outputs

- **Channel Tag:** It displays the channel tag, defined in the **Tag** parameter of each digital output.
- **State:** It displays the current value displayed by the channel.
- **Function:** It displays the function configured for each channel, defined in the **Actuation Mode** parameter of each digital output.
- **Forcing Value:** It allows you to force a specific value for each digital output channel by entering the desired value and clicking the **Force** button. When executing this function, the **State** parameter will adopt the forced value. To stop forcing, just click the **Release** button.
- **Update Forcing:** It allows you to update the forcing values of the already forced channels by clicking the respective button.

7.3.4 FORCING ANALOG OUTPUTS

- **Channel Tag:** It displays the channel tag, defined in the **Tag** parameter of each analog output.
- **State:** It displays the current value displayed by the channel.
- **Type:** It displays the type of output signal configured for each channel: 0-20 mA, 4-20 mA or 0-10 V.
- **Forcing Value:** It allows you to force a specific value for each analog output channel by entering the desired value and clicking the **Force** button. When executing this function, the **State** parameter will adopt the forced value. To stop forcing, just click the **Release** button.
- **Update Forcing:** It allows you to update the forcing values of the already forced channels by clicking the respective button.

7.3.5 COMMUNICATION

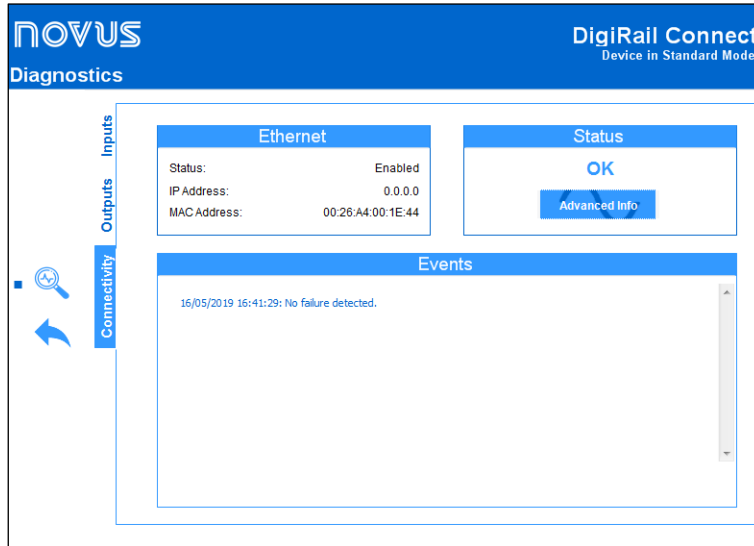


Fig. 35 – Diagnostics: Communication

7.3.5.1 ETHERNET

- **Status:** It displays if the Ethernet interface is enabled.
- **IP Address:** It displays the IP address of the device.
- **MAC Address:** It displays the MAC address of the device.

7.3.5.2 STATUS

It informs if the device is in an error state.

- **Advanced Info:** It displays the date, time and name of the event or error displayed by the device. Check **Table 06** and **Table 07** for further information on this.

EVENT FLAGS
Ethernet communication is enabled and running.
This device is connected via USB.
A Watchdog event occurred on the RS485 interface.
A Watchdog event occurred on the Ethernet interface.
One of the enabled channels has been forced.
One of the enabled channels has been paused.

Table 06 – Event flags

ERROR FLAGS
Analog output failure.
Digital output failure.
Power supply failure.
Analog inputs failure.

Table 07 – Error flags

8. TECHNICAL SPECIFICATION

FEATURES	DIGIRAIL CONNECT	
Input Channels	RAMIX Models	4 Digital and 2 Analogs
	DMIX Models	8 Digital
Output Channels	RAMIX Models	3 Digital or 2 Relays and 2 Analogs
	DMIX Models	4 Relays or 8 Digital
Analog Input	Analog Signals Accepted	Thermocouples J, K, T, N, E, R, S e B, Pt100, Pt1000, NTC, 0-60 mV, 0-5 Vdc, 0-10 Vdc, 0-20 mA, 4-20 mA
	Accuracy of Measure	Thermocouples: 0.2 % of maximum range Pt100, Pt1000, NTC, mA, V, mV: 0.15 % of the maximum range Cold junction error to be considered for measurements with thermocouples: J, K, T: $\pm 1\text{ }^{\circ}\text{C} / \pm 1.8\text{ }^{\circ}\text{F}$ N, E, R, S, B: $\pm 3\text{ }^{\circ}\text{C} / \pm 5.4\text{ }^{\circ}\text{F}$
	Input Impedance from Analog Channels	0-60 mV, Pt100, Pt1000, NTC and thermocouples : $>10\text{ M}\Omega$ 0-5 V, 0-10 V: $>1\text{ M}\Omega$ 4-20 mA: $15\ \Omega + (1\text{ V} @ 20\text{ mA})$
	Pt100	Maximum compensated cable resistance: $20\ \Omega$ Excitation current: 0.60 mA
	Analog Channel resolution	Analog inputs: 16 bits (65536 levels)
Digital Input	Logical Levels	Logical Level "0": $< 0.5\text{ V}$ Logical Level "1": $> 3\text{ V}$
	Maximum Voltage	30 V
	Input Impedance	270 k Ω
	Input Current @ 30 Vdc (typical)	0.15 mA
	Maximum Frequency (square wave)	Dry Contact: 10 Hz PNP: 250 Hz NPN: 250 Hz
	Minimum Pulse Duration	Dry Contact: 50 ms PNP: 4 ms NPN: 4 ms
Transistor Digital Output	Transistor outputs (Sourcing) Maximum load current: 500 mA Short-circuit current: 70 mA Maximum switching voltage: 30 Vdc Minimum switching voltage: 6 Vdc	
Relay Digital Output	Type: SPST-NO and SPDT Maximum load current: 3 A (SPST) / 6 A (SPDT) Switching voltage: 250 Vac Suitable for resistive loads	
Analog Output	Signal types: 0-20 mA, 4-20 mA, 0-10 V Maximum load: 0-20 / 4-20 mA: $\leq 500\text{ Ohms}$ 0-10 V: $\geq 2000\text{ Ohms}$ Resolution: 12 bits Accuracy: 0.5 %	
Communication Interfaces	USB Ethernet: 10/100 Mb/s, IEEE standard 802.3u RS485	
Configurator Software	NXperience (via USB for desktops and notebooks)	
Power Supply	Voltage: 10 Vdc to 36 Vdc Maximum consumption: 5 W Typical consumption: 20 mA	

Dielectric Rigidity	See Fig 12
Operating Temperature and Humidity	Temperature: -20 to 60 °C Humidity: 5 to 95 % RH, non-condensing
Housing	ABS+PC
Protection Rating	IP20
Dimensions	100 x 30 x 110 mm

Table 08 – Technical Specification

9. WARRANTY

Warranty conditions are available on our website www.novusautomation.com/warranty.